Chapter 2

2. Assess the degree to which the intent of the Klamath Act and the five general goals of the Long Range Plan have been met. Specifically assess the degree to which returns of natural anadromous fish stocks in the Klamath River have increased (or decreased) basin-wide and by sub-basin, where feasible.

The evaluation team employed three different methods to carry out Task 2. First, the minutes of 21 TF meetings, stretching from 1987 through 1997, were examined, the issues addressed by the TF in its meetings were inventoried, and the actions taken by the TF on each such issue was entered into a database (Appendix 2-1). The database was then used to evaluate the range of Klamath Act issues and *Long Range Plan* goals the TF addressed and how these issues were disposed of. The results of the inventory and assessment are discussed below and summarized in Tables 2-1 and 2-2.

Second, the evaluation team interviewed TF and Klamath Fishery Management Council members, members of the Technical Work Group (TWG), and others knowledgeable in the work of the TF and the progress of the Restoration Program. The results of these 35 interviews were entered into a database (Appendix 2-2) and are summarized below.

Finally, information concerning the status of fish stocks in the basin was acquired from the responsible agencies, tribes and other fisheries professionals interested in and knowledgeable about Klamath River basin fish stocks. That information is summarized below.

Program Evaluation as Measured by Meeting Agendas and Task Force Actions

The Klamath River Basin Fisheries Task Force generally meets four times per year in various locations throughout the basin. The agendas follow a pattern geared to the annual adoption of a workplan which awards restoration funds to specific projects. A Request for Proposals (RFP) is adopted by the Task Force indicating to bidders what types of projects are sought for the next fiscal year and how priorities will be determined. Proposals are then solicited, projects ranked and the workplan adopted at the June meeting.

One dimension for evaluating program success is to examine how the Task Force has spent its time in meetings and what actions have been taken. To do this the items on Task Force agendas have been divided into several broad categories (See Table 2-1, below, and Appendix 2-1, “Actions taken by the KRBFTF 1991-1997”). Although there is judgment in how agenda items are categorized, the list provides a general indication of the range of subject matter and Task Force effort as measured by the number of times various items are covered. It should be noted that the “Task Force business and procedures” category includes the discussions pertaining to the annual workplan, and therefore cover many subtopics which are better evaluated in the project-specific analysis.

Table 2-1: KRBFTF Meeting Agenda Topics

AGENDA TOPIC	21 MEETINGS 1991-1997
TF business and procedures	47
- Adoption of Annual Workplans and revisions	9
Interagency Coordination	40
Flow	26
Upper Basin Amendment	23
IFIM	29
Fish Management	16
Hatchery Operations, Hatchery-Wild Stock issues, and Small-scale rearing	13
Trinity Restoration Program	14
Endangered Species Act	10
Public Education	9
Long Range Plan	9
Habitat Protection and restoration	9
Timber Harvest	7
Stock ID and specific stock protection	6
Ag.-private cooperation, CRMPs, FERC, GIS, KFMC, KPOP, Mid-Program Review, Mining, Water Quality, Legis. Coord.	7 or less agenda items each

TF business and procedures: Most Task Force meeting time is spent deciding how to spend restoration funds. Since its creation the Task Force has struggled with the challenge of deciding where to place scarce Restoration Program dollars in a basin as large as the Klamath, with so many different interest groups, landowners, kinds of impact, restoration needs and varied fish stocks. The pending listing of several stocks under the Endangered Species Act has only heightened the frustration.

The relative scarcity of restoration funds has resulted in continuous attempts through the years to revise the procedures used to solicit, rank, and award projects. In its attempts to increase the equity and rationality of project selection, the Task Force has discussed some aspect of the following at almost every meeting:

- What categories of projects should be solicited, from whom, and in what part of the basin
- How much funding should be budgeted for each category
- What point system should be used for ranking projects
- Who can participate in ranking

- The role of the Technical Working Group vis-à-vis the Task Force
- What to do with unspent funds, and how to adjust for budget shortfalls
- How to deal with carry-over projects and continuing support of the CRMPs
- How to deal with the large "budget grabbers" like Task Force administration, long term monitoring, and the IFIM flow study.

In answering the question "Does consensus work?" one of the measures most often cited by Task Force members is that, in spite of disagreements on one part of the process or another, a budget has been adopted each and every year. The rules on who can participate in ranking and voting now appear to meet with general approval. However the process of project categorization, ranking and prioritization continues to evolve, and will go through more changes as the TF focuses on sub-basin issues.

Other items within this category deal with how the TF meets its obligations for complying with the Klamath Act, including how to foster and account for the required non-federal match to restoration funds, and how to comply with provisions calling for preferential hiring of certain groups for restoration projects.

Interagency Coordination: The second most frequent meeting agenda item includes the update reports from agencies involved in the basin, including the U.S. Forest Service, California Department of Fish and Game, USFWS and the Department of the Interior. These reports serve to keep the Task Force informed on activities which influence fish restoration efforts. The reports are usually for information only, although in some cases the Task Force acts to send letters in response to the topics raised.

Flow: Because the U.S. Bureau of Reclamation presents a status report on flow and lake conditions at almost every TF meeting it has been separated out from the Interagency Coordination category. Since flow directly affects the competing needs of agricultural diverters and fish production the TF often engages in discussions regarding the need for greater USFWS participation in BOR decisions.

Upper Basin Amendment: The Upper Basin Amendment (UBA) has been on the agenda of almost all meetings during the evaluation period. Divisive sessions have consumed the Task Force's attention, and it remains a focus of unresolved concern.

The primary issues have included:

- whether the Upper Basin should be included within the purview of the Task Force
- what representation the Upper Basin interests should have on the Task Force
- the tensions between upstream agricultural water users and downstream fish production needs for improved water quality and quantity
- whether an amendment should be added to the Long Range Plan addressing goals, policies and objectives for the Upper Basin, and what form it should take.

The TF has spent extensive meeting time debating the issue, including the time of an UBA sub-committee. At some points the TF appeared to almost reach consensus, but a decision still remains elusive. Although the item continues to appear on TF agendas the opposing positions now appear to have hardened pending the outcome of decisions outside the Task Force's authority, such as the upper Klamath water adjudication process and the activities of the Hatfield committee. The TF should discuss whether it wishes to continue its thus-far fruitless debate over adoption of the proposed Upper Basin Amendment.

IFIM Study: Discussions regarding an instream flow study for the Klamath River continue as a recurrent agenda topic. Issues have dealt with:

- the need for the study
- the geographic area it should cover, e.g. the main stem below Iron Gate Dam, the tributaries of the Scott and Shasta, and the area above Iron Gate
- what technical elements it should include
- what agencies or consultants should be hired to participate in the study
- how much funding should come from the Task Force budget vs. other public and private entities
- What the role of the TWG and TF should be in shaping the study

Because the study is so expensive, the natural system so complex, and stakeholder fears concerning the implications of possible study results so strong, it has been difficult for the Task Force to move ahead with the study. In spite of the TF not reaching a consensus the TF Chairman, who represents the Secretary of the Interior, made an executive decision on behalf of the Secretary to begin contract negotiations for certain portions of the study, taking advantage of one-time funds that had become available. This "consensus override", as it was perceived by some, was met with mixed reaction from Task Force members who suddenly were confronted with the reality that ultimately the TF serves as an advisory body to the Secretary, not as a final decision-maker.

Subsequently the TWG has invested extensive effort conducting a scoping study for the IFIM, and the decision-making for the scope of work, hiring of consultants, and study performance continues among the various agencies (e.g. USFWS, USGS/ NBS, and DFG) contributing to the effort. Because the study will compete for a large share of restoration dollars it will continue to have a prominent place on upcoming agendas.

Other topics: The remainder of agenda topics covers a range of ongoing issues in the basin. These include discussions concerning fish management and the status of various fish populations, concerns regarding hatchery vs. wild fish stocks, upslope watershed management, the impacts of land uses such as mining, agriculture, timber harvesting, the development of GIS capability for the Restoration Program, and public education concerning restoration efforts. Each of the topics relates to objectives in the Long Range Plan and thus contributes toward its implementation.

The goals of the Klamath Act and Long Range Plan

As stated in the Long Range Plan, the goals of the Act are summarized here:

Goal I: Restore, by 2006, the biological productivity of the Klamath River Basin in order to provide for viable commercial and recreational ocean fisheries and in-river tribal (subsistence, ceremonial and commercial) and recreational fisheries.

Goal II: Support the Klamath Fishery Management Council in development of harvest regulation recommendations that will provide for viable fisheries and escapement.

Goal III: Recommend to the Congress, state legislatures, and local governments the actions each must take to protect the fish and fish habitats of the Klamath River Basin.

Goal IV: Inform the public about the value of anadromous fish to the Klamath River region and gain their support for the Restoration Program.

Goal V: Promote cooperative relationships between lawful users of the Basin's land and water resources and those who are primarily concerned with the implementation of the Restoration Plan and Program.

Agenda items were classified according to which goal, or goals, they promote. As in the previous section there is discretion as to how individual items are categorized. Nevertheless the numbers provide a general sense of Task Force success.

Table 2-2: How TF Agenda Items Address the Long Range Plan Goals

Goal	Number of Agenda Items
I	240
II	18
III	45
IV	16
V	68

The greatest effort by the Task Force was directed to Goal I, restoring biological productivity, through its actions to adopt a Restoration Program workplan for each year. The lowest efforts (as measured by number of agenda items) were in Goal IV, Public Education and Goal II, KFMC cooperation.

Goal I - Restoring Productivity: The greatest effort of the Task Force and its guiding light for all agenda items has been directed to this goal of restoring the biological productivity of the Klamath River Basin to provide viable fisheries. Discussion regarding how well this effort has been achieved so far is found in other sections of this report (see, especially, Task 5).

Goal II - KFMC support: The language of Goal II is fairly specific in directing the TF to support the KFMC in the development of harvest regulation recommendations. While a large portion of TF actions could be construed to contribute to the overall information base for developing harvest regulations, 1) the TF does not usually express specific intent of supporting KFMC harvest decisions, and 2) the transfer of information from the TF to the KFMC is primarily through informal channels via overlapping membership, attendance and staffing, minutes and word-of-mouth. Joint meetings of the two bodies have periodically occurred and should be continued, especially to underscore the linkage between the two bodies for those members who do not normally attend both groups. See also the discussion regarding the KFMC in Chapter 6.

Goal III- Intergovernmental recommendations: Actions to meet this goal were measured primarily by letters sent by the TF in support or opposition of some action. This goal was interpreted broadly to include communications with state agencies as well as legislative bodies. As shown in the prior section, the number of agenda items dealing with interagency communication is the second highest effort of the Task Force.

Goal IV - Public Education: Measuring the success of public education by the number of agenda items is deceptive. Most of the distinct effort towards public education was put forth in the early portion of the evaluation period with specific projects funded for curriculum development and distribution of a Restoration Program newsletter. Although other projects have now taken precedence, the findings of the "public awareness" portion of this evaluation in Chapter 9 indicate that the press coverage of fishery issues within the basin has increased overall, and in part this has been reinforced by the education fostered in the school curricula. Public education has also been promoted as the CRMPs continue to operate and bring landowners into the restoration process. While restoration funds have not been directed to specific education efforts in recent years, the TF should continue to be cognizant of this goal and not let all efforts become passive.

Goal V - Cooperative relationships: Actions pertaining to this goal include all the items concerning the formation, support and projects of the CRMPs and specific user groups, which serve as direct public outreach and education. Items also include the Private Landowner awards which acknowledge public-private cooperation in fishery restoration, letters sent to landowners soliciting information for specific purposes, and the interest-group meetings called to discuss issues such as Upper Basin Amendment and IFIM scoping. Numerous agenda items also deal with programs of other agencies, which result in cooperation directly or indirectly on, for example, the USFS forest planning process, the re-organization of federal agencies in the Ecosystem Restoration Office (ERO), and the Klamath Compact and KPOP process.

In sum, the Task Force has made substantial progress towards all the goals of the Klamath Act and Long Range Plan as measured by the time it has spent discussing and debating the complexity of basin restoration issues. Although individual members express genuine frustration with Task Force progress in resolving specific issues or reaching final decisions, the nature of the restoration effort is such that decisions are never final, and new challenges continue to emerge. The Task Force has at least brought the wide range of issues to the table during its tenure and serves as a forum for debate and mutual education which otherwise would not exist.

Program Evaluation as Measured by Interviewing the TF, KFMC and Others

The majority of the interviews were conducted in person and lasted approximately two hours. Interviews were conducted by telephone when meetings could not be arranged. A "running list" of questions was used to prompt responses during interviews, but questions were open-ended and individuals were encouraged to express opinions regarding any area of concern. Anonymity was offered to respondents in the form of number-coded responses.

A total of 35persons were interviewed. Handwritten notes from the interviews were condensed and transcribed into tabular form. The condensation of the interviews organized by topic and interviewee is presented in Appendix 2-2.

Findings

The perceptions of the interviewees concerning the reasons for the declines of fish conditions in the Klamath River basin are summarized below. It is strongly recommended that readers read the interview summaries in Appendix 2-2 to gain a more complete view of the opinions expressed.

<u>Identifying the reasons for fisheries decline</u>

The findings here do not present a scientific analysis of the status of Klamath fish stocks. Rather, they relate to the perceptions of those interviewed, which are important because they underlie the decisions made by the participants in the Restoration Program.

Finding: The majority of Task Force members believe Klamath fisheries are more severely impacted by water quality and water management problems than by fish harvest or ocean factors. Differences in opinion lead to differences in how individuals set their priorities for action.

<u>The status of fish stocks</u>

While most respondents believe that fish stocks within the Klamath basin are threatened to some degree, there is not complete agreement on how severe the threats are. Most parties believe the recent proposed listings of various stocks under the federal Endangered Species Act are compelling evidence of the precarious status of Klamath fish. The summer 1997 fish kill on the mainstem of the river is also seen by many as a harbinger of future population crashes caused by worsening water quality conditions.

A few respondents, however, believe the downward trend is temporary and only part of a larger, natural cycle of population fluctuations which will rebound on its own at some time in the future. Some respondents consider ocean-based impacts to outweigh the effects of in-river impacts.

A concern of several respondents is the potential loss of genetic diversity of wild fish stocks that have evolved under the conditions of individual Klamath tributaries. While anadromous species as a whole are acknowledged to be resilient, and may be able to repopulate the Klamath system if conditions become more favorable, the concern is that restocking would occur from hatchery fish intermixed with remnant individuals from various wild populations, thereby diluting or eliminating the original genetic richness of the Klamath system.

Water supply and water quality

As recognized in the 1991 *Long Range Plan,* the causes of fish decline in the Klamath Basin are not attributable to any single source. However, the majority of responders now believe the primary in-river factor currently affecting fish is poor water quality combined with insufficient water quantity and loss of refugia in the mainstem, upper basin and tributaries at critical times of year.

Responders attribute decline in water quality to several factors, most importantly:

- High temperature and high nutrient return water from irrigated agriculture

- Loss of cold-water refugia along the length of the mainstem and tributaries, primarily due to

  1) warm-water discharges at the mouths of previously cold tributaries caused by warm agricultural return water;

  2) livestock grazing practices, which collapse banks, destroy riparian canopy and trample cold-water springs;

  3) drowning of cold-water springs and creek mouths by the reservoirs of Iron Gate and Copco dams;

  4) upslope erosion, which fills pools and clogs spawning gravels;

  5) Warm water and/or low dissolved oxygen releases from Iron Gate Dam.

- De-watering of tributaries by agricultural withdrawals

These factors interact to create conditions of low dissolved oxygen, high biochemical oxygen demand and stressful temperatures, which combined with the loss of cold-refugia severely stress fish during critical migration and summer rearing periods.

Fish passage

The direct blockage of fish passage caused by the Iron Gate and Copco dams continues to be recognized as a primary impact reducing spawning area in the Klamath Basin upstream of the dams. Responses from interviewees range from “this is a historical fact and we can’t do anything about it” to "the FERC relicensing studies should consider all alternatives, including possible dam removal."

Fish harvest and ocean impacts

Issues regarding fish harvest were specifically eliminated from this contract and are not included in this analysis. Thus in-river and ocean-related impacts on fish stocks, foreign and domestic harvest, sea-lions, and El Niño impacts are not assessed here.

Disputes continue, however, between agricultural water users and various categories of fishermen as to who is most responsible for impacts. Fishermen believe they have taken the brunt of regulatory cutbacks in the form of severely curtailed seasons and harvest limits, while agriculture has not contributed a fair share towards improvement in water quality, quantity, irrigation practices, or grazing impacts. These perceptions of blame vs. self-innocence, supported by inconclusive scientific evidence significantly affect the decisions made by members of the Task Force and TWG when considering what restoration efforts are most appropriate.

Other land use impacts

Several respondents cited the continuing impact of upslope impacts from forestry and other land uses in the basin which cumulatively affect fish habitat. Particularly cited is the extensive network of abandoned or poorly-maintained forest and rural roads, which chronically contribute sediment, affecting spawning gravels and channel morphology. These problems are discussed in the Long Range Plan, but have had little attention by the Task Force. Respondents suggest this is because the scale of the problem is so large that there isn’t enough Task Force money to accomplish much. The few projects that have addressed this issue are viewed favorably, others are still in progress.

Klamath Evaluation Program Fish Population Trends

Here we depart from the evaluation team's review of the TF's meeting products and interview data concerning the community's perceptions of how well the Act and goals have been implemented and provide of roundup of actual data concerning how the basin's fish stocks are actually faring after more than a decade of Restoration Program effort.

Consistent data on Klamath Basin fish population trends for roughly the last 20 years is available only for chinook salmon and summer steelhead. The data on the latter is not particularly precise because of changing methods of counting and varying lengths of stream surveyed, but still allow an assessment of trends. Stream surveys and downstream migrant trapping have helped to determine the range of winter steelhead, coho salmon and cutthroat trout but quantitative data for population assessment is lacking. USFWS recently compiled data from downstream migrant traps that give some indication of the order of magnitude of recruitment in various years (USFWS, 1998). Catch data of green sturgeon caught in the Klamath River has provided some additional information on recruitment of this species but still allows no overall estimate of population size. There is little data on Pacific lamprey and eulachon but the Yurok Tribe has compiled information on these species in a recent report (Larson and Belchik, 1998).

Discussions include possible reasons for the variability of escapement where information is available. A Klamath River Fall Chinook Review Team was convened in 1993 as required by the Pacific Fisheries Management Council because of failure to meet the Klamath River Basin escapement floor of 35,000 fall chinook salmon. Their report (PFMC, 1994) provides some insight into various factors effecting survival of hatchery and wild fish.

Fall-run chinook salmon

There have been some dramatic swings in fall chinook salmon populations since monitoring began in 1978 and since the inception of the Klamath River Basin Fisheries Restoration Program (Figure 2-1). The California Department of Fish and Game (CDFG) data summarized in Figure 1 may under-estimate hatchery fish (Kier Associates, 1991). Fall chinook escapement to the entire Klamath-Trinity Basin for the years 1985-1988 was robust, with an average of 129,700 adults spawning annually. However, upwards of 90% of the fish returned to the Iron Gate Hatchery, Bogus Creek, the Trinity River Hatchery and reaches of the Trinity River below (PFMC, 1994). High survival rates in the ocean for these year classes was partially as result of reduced ocean fisheries (PFMC, 1994).

Escapement of fall chinook from 1990 to 1992 fell below the 35,000 fish floor for natural spawners set by the Klamath Fisheries Management Council and adopted by the PFMC. The low basin-wide escapement was triggered by a combination of poor survival in the marine environment, harvest management errors, poor habitat conditions in freshwater related to drought and hatchery operations (PFMC, 1994).

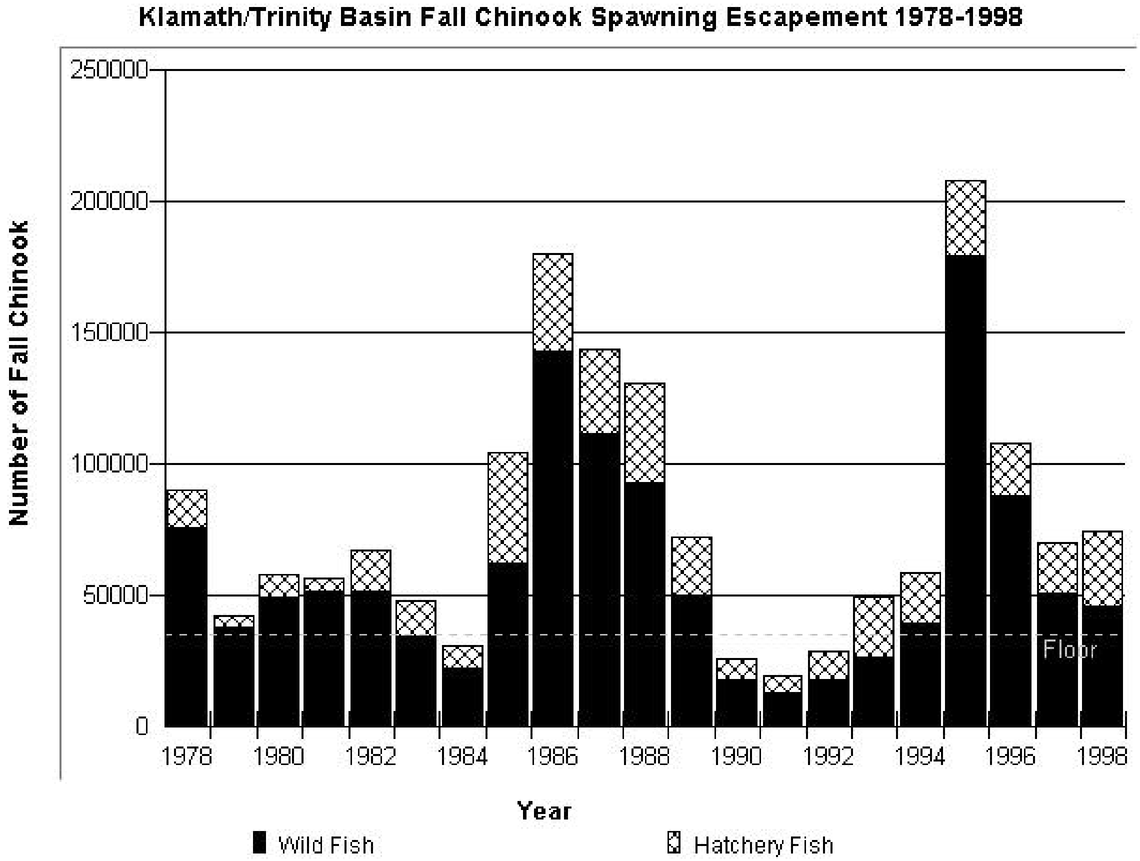

Figure 2-1. Fall chinook salmon escapement trends for the entire Klamath-Trinity Basin are displayed above with a breakdown of hatchery fish and wild fish. Data from CDFG, 1998.

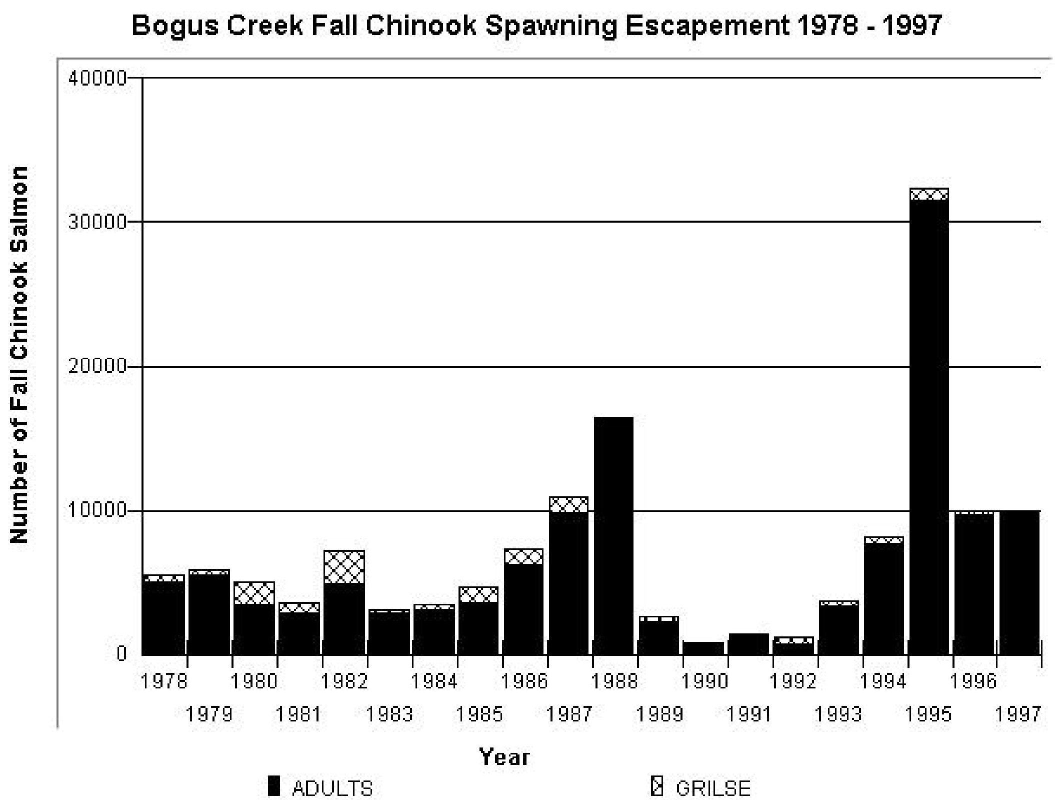

Figure 2-2. Bogus Creek fall chinook escapement from 1978-1997, including a breakdown of adults and grilse. Data from CDFG, 1998.

Bogus Creek: This stream is one of the most productive watersheds for fall chinook salmon in the Klamath Basin, although populations in some years may be inflated by it's proximity to Iron Gate Hatchery. Returns of fall chinook to Bogus Creek from 1978-1997 ranged from 785 to 33,335 adult and grilse (Figure 2-2). Grilse are chinook salmon, usually males that mature after just one year in the ocean and return at a small size. Population levels in 1988 and 1995 were particularly inflated as a result of straying from Iron Gate Hatchery.

Shasta River: Although the Shasta River fall chinook population fell to an all time low in 1990 (533) it rebounded to 13,511 in 1995, the highest return since 1978 (Figure 2-3). Low escapement to the Shasta River may have been keyed by drought conditions which exacerbated water quality problems in the basin and in the mainstem Klamath River (PFMC, 1994). The Shasta River fall chinook must share 175 miles of the mainstem Klamath River with competing Iron Gate Hatchery fish. It is possible that depressed escapement in the Shasta River from 1990 to 1992 was in part owing to the huge releases of fingerlings chinook in the preceding (1986-1988) brood years and problems with competition in the mainstem Klamath (PFMC, 1994). Shasta River fall chinook stocks rebounded sharply in 1995 to 13,511 which may be in part owing to pulse flows which occurred in 1992. Pulse flows help flush young salmon and steelhead out of the Shasta before water quality problems increase during summer.

Scott River: Fall chinook escapement to the Scott River basin has ranged from a low of 1615 fish in 1990 to 14,477 in 1995 (Figure 2-4). Recent fall chinook run trends in the Scott River are encouraging as average returns from 1995-97 have been 11,622. This compares with the 1978-1994 average of 4,865 fall chinook adults and grilse. Decreased 1998 returns may have been as a result of poor ocean survival in 1997 which was an El Niño year in the ocean with associated warm water conditions. The Scott River fall chinook population sometimes is confined to the lowest reaches of the river in drought years, which poses a risk to survival if high flows occur in the subsequent winter. Access to reaches further upstream is partially obstructed by low flows related to fall stock watering (Scott CRMP, 1996).

Salmon River: The lowest fall chinook escapement since 1978 was in 1980 when only 1,000 fish returned but 1995 and 1997 both had approximately 5630 spawners, tying for the largest run size (Figure 2-5). From 1978 to 1997 the average fall chinook escapement was 2670 but runs fell to 1,438 in 1998, probably as a result of poor ocean conditions in 1997. While most other stocks in the Klamath Basin were depressed in 1990, the Salmon River return was relatively robust. This may be owing to high flows in 1986 that improved rearing conditions. Also Salmon River fish may have less competition with Iron Gate Hatchery fish because of the shorter, shared migration distance.

Lower and Middle Klamath Tributaries: Only Blue Creek in the Lower Klamath Basin has been surveyed for adult fall chinook regularly over the last decade with USFWS conducting early surveys (USFWS, 1990) and more recent ones conducted by the Yurok Tribe (1998). Several Middle Klamath Basin tributaries have been surveyed since 1995

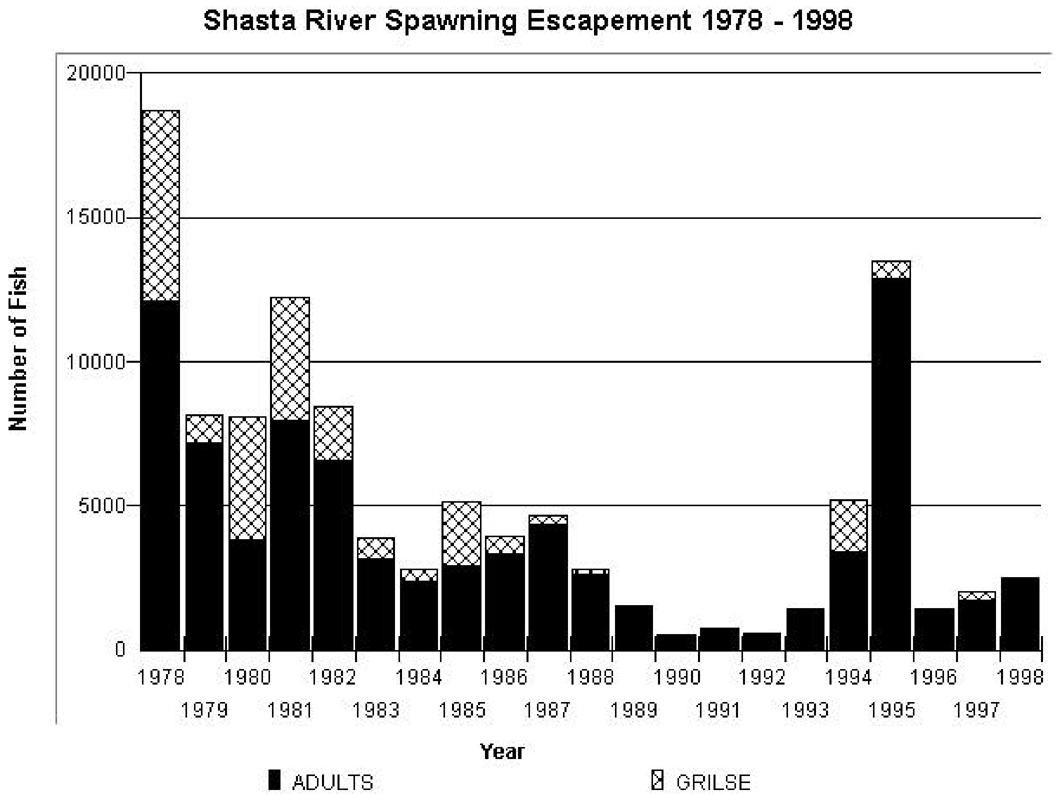

Figure 2-3. Shasta River fall chinook salmon spawning escapement from 1978-1998, including a breakdown of grilse and adults. Data from CDFG, 1998.

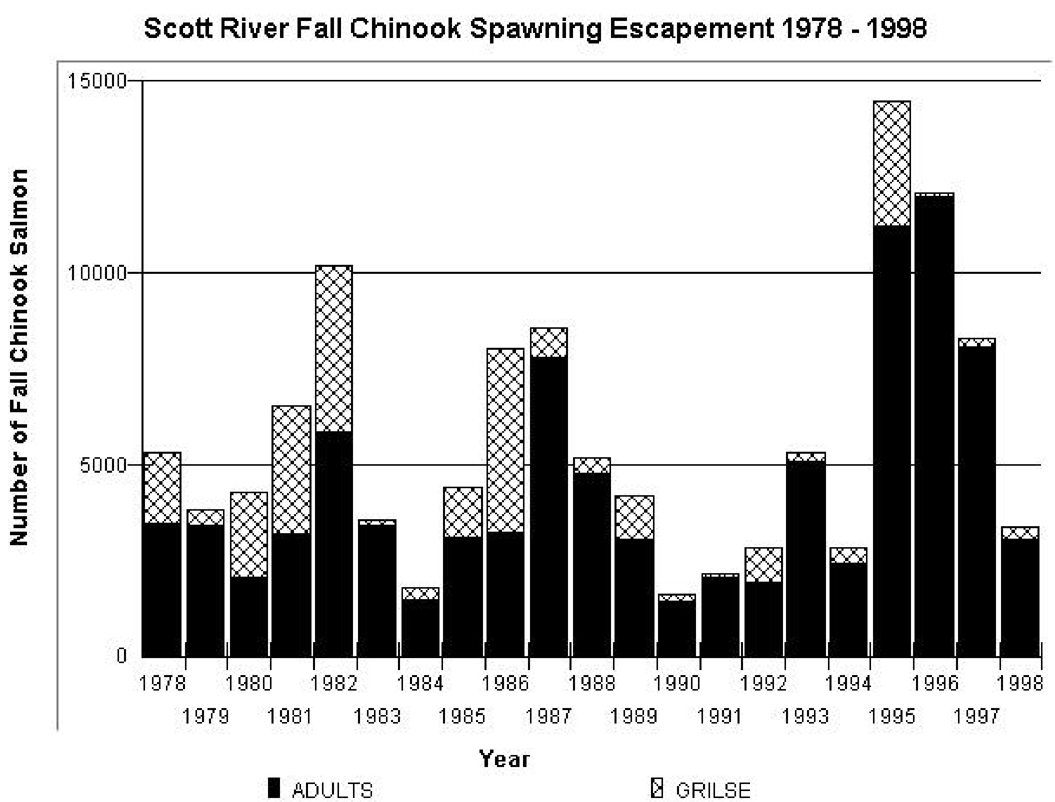

Figure 2-4. Scott River fall chinook salmon escapement estimate from 1978-1998, including a breakdown of adults and grilse. Data from CDFG, 1998.

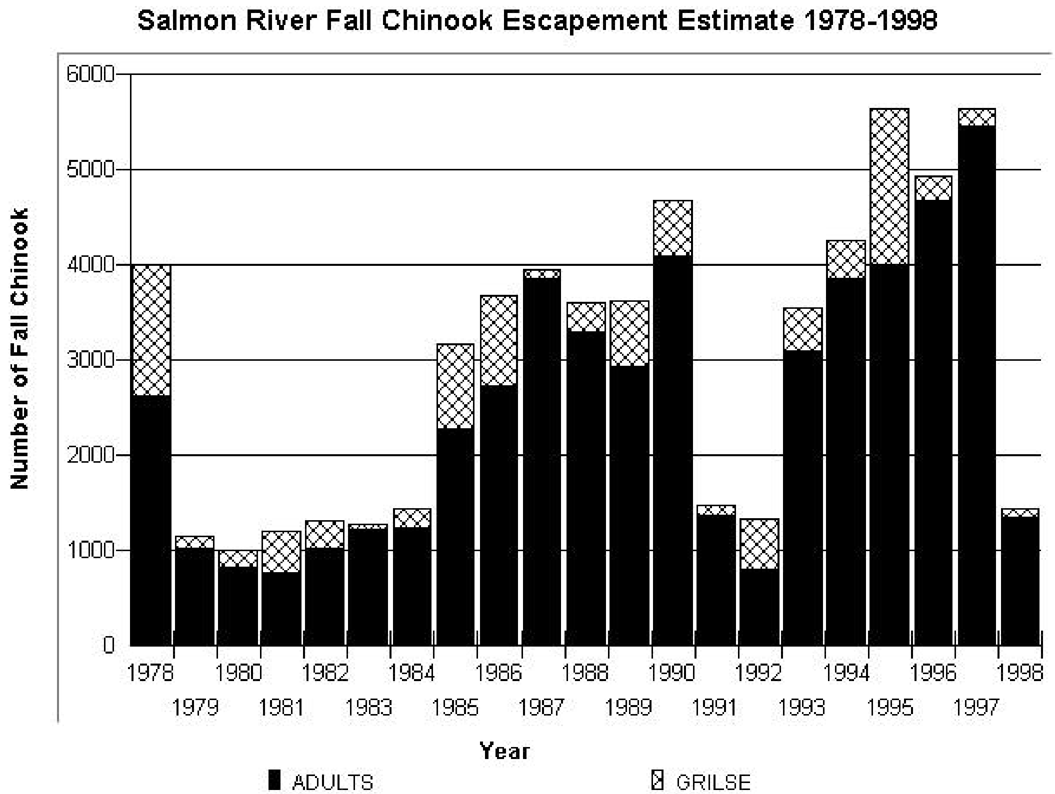

Figure 2-5. Salmon River adult and grilse fall chinook salmon escapement from 1978 to 1998. Data from CDFG (1998).

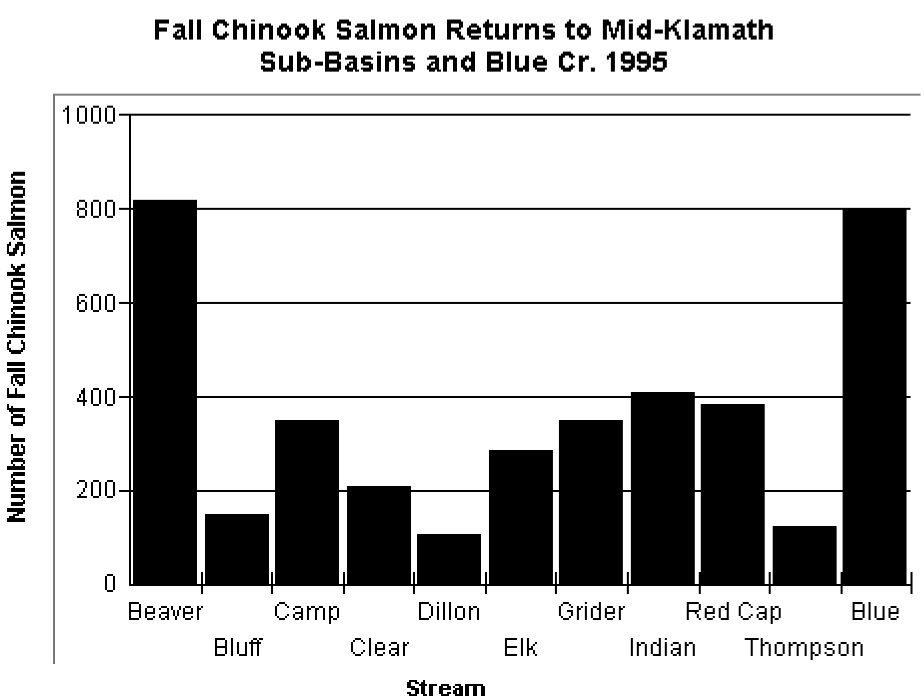

Figure 2-6. Estimated fall chinook salmon escapement to various Middle Klamath tributaries and Blue Creek for 1995. Blue Creek counts were from one week only. Data from CDFG and USFS cooperative effort.

including Bluff, Dillon, Camp, Red Cap, Beaver, Horse, Grider, Indian, Clear, Elk and Thompson Creeks. Not all tributaries are surveyed in all years.

The Yurok Fisheries Department has surveyed Blue Creek since 1994 and over 800 fall chinook were counted in one week in 1995. This weekly count is equivalent to total basin escapement estimates for most of the significant producing Middle Klamath tributaries (Figure 2-6). Production in this basin is assisted by Key Watershed management by Six Rivers National Forest (see Habitat Trends). USFWS (1993) was concerned with spawning success fall chinook salmon using the lower reaches of Blue Creek because of high sediment supply and bedload mobility.

Many Middle Klamath tributary basins may have somewhat inflated fall chinook salmon returns because of pond rearing and small scale hatchery operation (see Large and Small Scale Hatchery Evaluation). Supplementation has occurred in Grider, Indian, Elk, Bluff, Camp, Red Cap and Beaver Creeks. In 1995 Beaver Creek had the largest return of fall chinook of all Middle Klamath Basin tributaries with approximately 800 fish. Camp, Grider, Indian and Red Cap Creek all had returns from 350 to 400 fall chinook.

Fall chinook returns to Middle Klamath Basin tributaries (Figure 2-7) were very robust in 1996, with over 1,500 spawners returning to Red Cap Creek. Camp Creek, which is nearby, had 902 spawning fall chinook and Indian Creek had 756 fish. The highest number of returning adults in 1997 (Figure 2-8) was to Camp Creek with 910 fall chinook, almost identical to the 1996 run. Red Cap and Indian Creek were again top producers with 709 and 688 spawners, respectively. Elk Creek had fall chinook returns of 285, 402 and 480 since 1995 while Clear Creek returns ranged from 207 to 425.

<u>Spring-run chinook salmon</u>

The Salmon River has the only substantial remaining wild spring chinook population in the Klamath Basin above the Trinity River. This run dropped to an all time low of 170 adults in 1990 but rebounded to an average of over 1,200 per year between 1993 and 1997 (Figure 2-9). Increased returns could have been in part owing to improved flows and decreased ocean fishing pressure. Unfortunately, spring chinook runs plummeted in 1998 with Salmon River runs falling below 300 spawners. It is likely that this decrease was in response to poor ocean conditions during the El Niño year of 1997. The other significant wild spring chinook population in the Klamath Basin returns to the South Fork Trinity River. These fish were thought to be near extinction (PWA, 1994), but returns ranged from 232 to 698 between 1992 and 1995 (Dean, 1996). Returns in this basin also dropped in 1998 (Chris James, personal communication).

<u>Coho salmon</u>

There is almost no data available on coho salmon population trends in the Klamath Basin with two exceptions. CDFG estimates abundance of coho salmon for the Trinity River, but returns are dominated by hatchery fish. The Shasta Rack counts give some indication

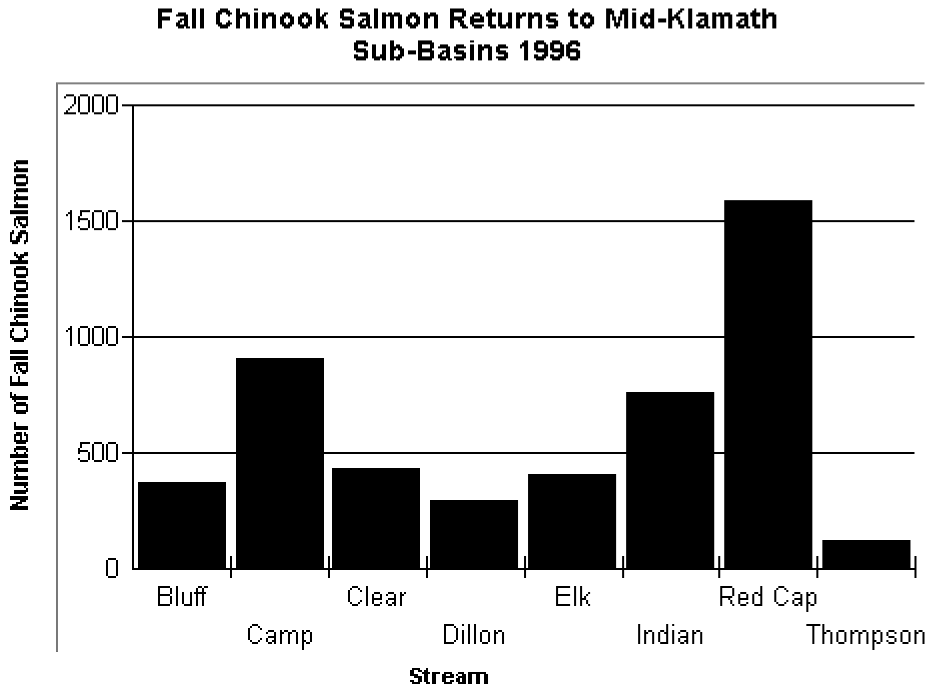

Figure 2-7. Estimated fall chinook salmon escapement to various Middle Klamath tributaries in 1996. Data from CDFG and USFS cooperative effort.

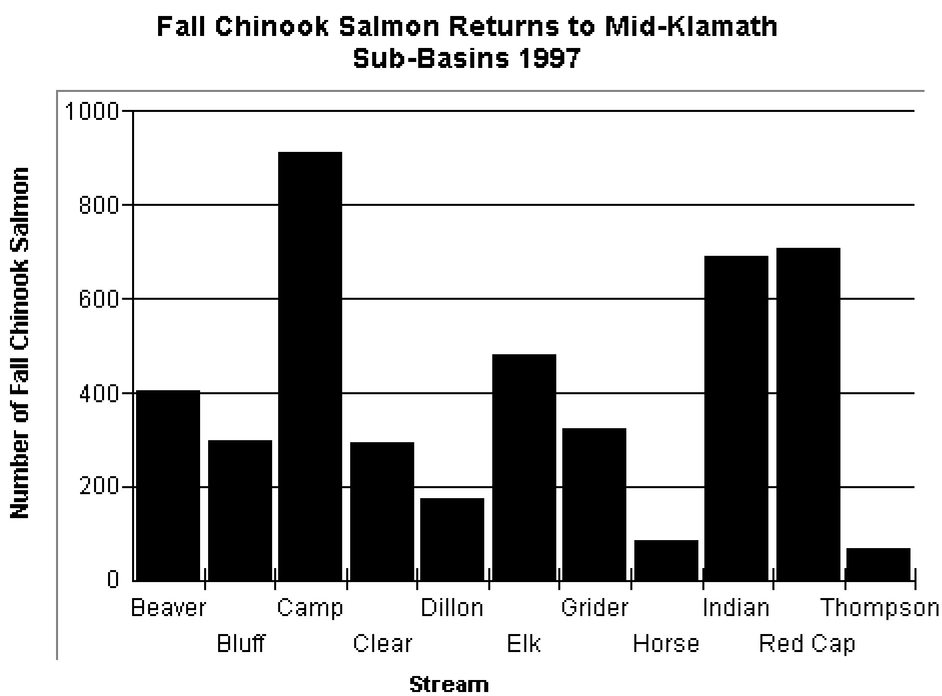

Figure 2-8. Estimated fall chinook salmon escapement to various Middle Klamath tributaries in 1997. Data from CDFG and USFS cooperative effort.

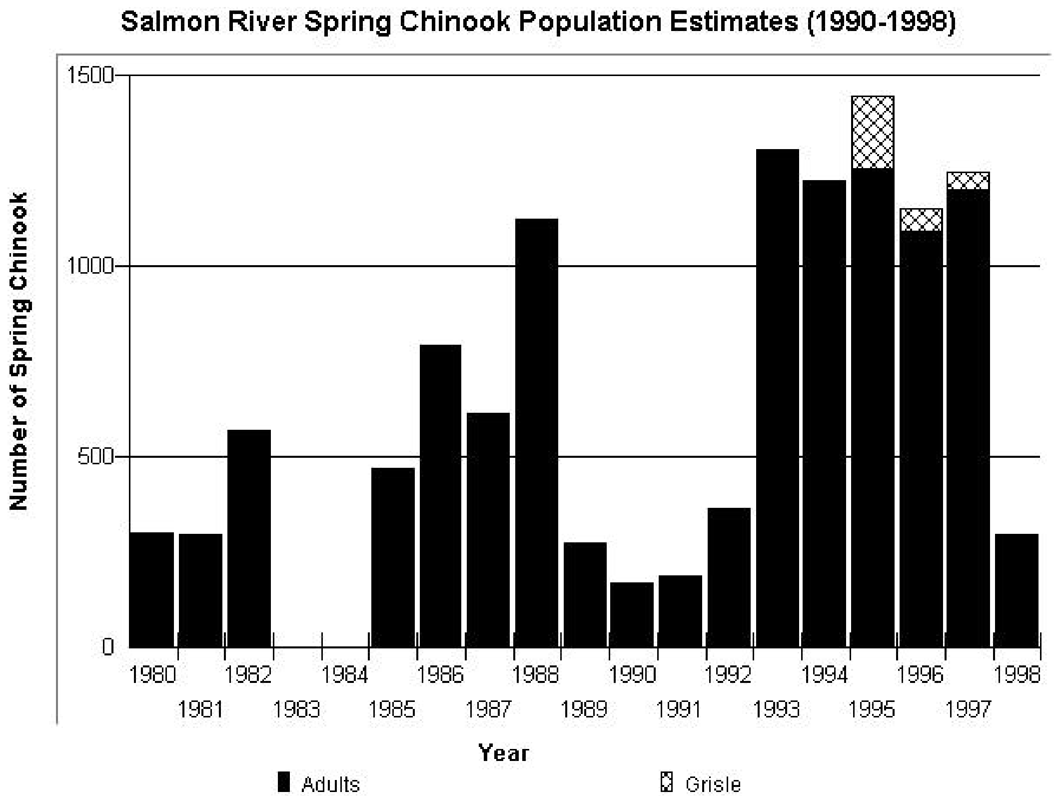

Figure 2-9. Salmon River spring chinook salmon population estimates 1980-1998. There were no counts in 1983 and 1984. Data from Klamath National Forest.

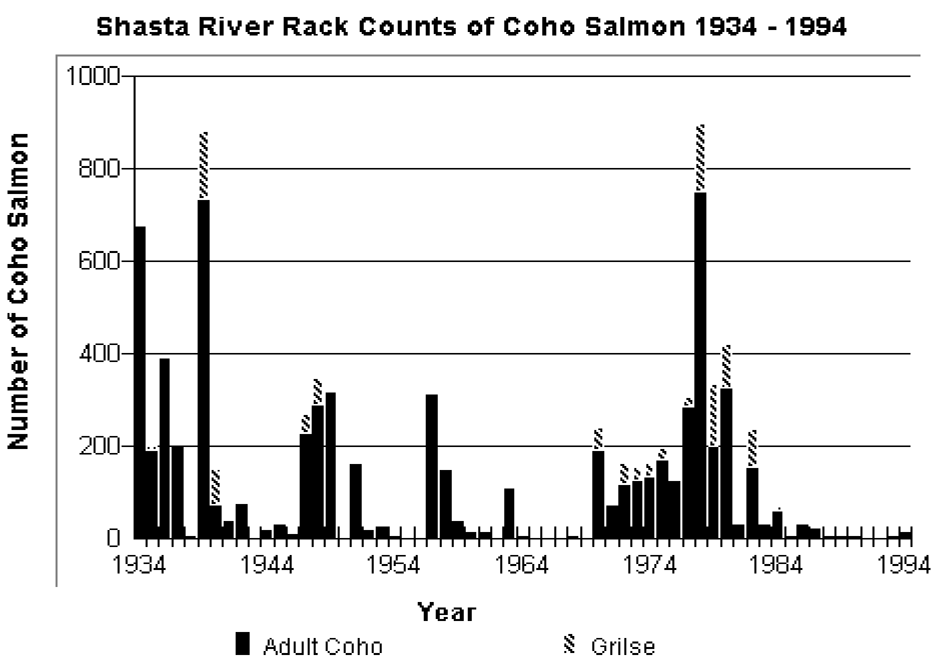

Figure 2-10. Coho salmon counts at the Shasta Racks from 1934 to 1994. Counts reflect different levels of effort and do not represent population estimates. Data from CDFG (1997).

of abundance of wild coho since the 1930's (Figure 2-10). Unfortunately, the racks have been operated for different lengths of time in various years and are often removed before coho salmon return. Therefore, the number of fish shown in the chart is not representative of population levels. The Shasta Racks have not been operated past the end of November since 1986 and native coho often spawn in December or January.

Wild coho salmon returns to Six Rivers National Forest streams seem to show strong and weak year classes (Jerry Boberg, personal communication). Because the age at maturity of coho salmon is almost invariably three years, the species is more subject to year class fluctuations than chinook salmon or steelhead. While coho salmon are widely distributed in the Klamath and Trinity basins, there are no known robust populations (consistently above 500 fish) that could serve as sources for colonization or broodstock for small scale hatcheries to help restore populations. Work by the Yurok Tribe suggests that coho juveniles are abundant in the Crescent City Fork of Blue Creek (Voight and Gale, 1998). Adult population levels in Blue Creek are difficult to ascertain because high flows that often occur during the spawning season (December-January) and the remote location of the this tributary. See discussions of Juvenile Salmonid Trends below for more information on estimates of coho at USFWS downstream migrant traps.

Steelhead

While there is almost no data on wild winter steelhead populations, the California Department of Fish and Game and U.S. Forest Service have teamed up to acquire data on summer steelhead since about 1980. One index of abundance for winter steelhead is fish rescue by personnel from the Yreka Screen Shop, where the number of fish rescued has dropped significantly in recent years (Ron Dotson, personal communication). Based on both summer steelhead data and steelhead population trends at Iron Gate Hatchery, it would appear that steelhead are undergoing a basin-wide down turn in Klamath tributaries above the Trinity River since about 1989. See discussions of Juvenile Salmonid Trends below for more information on estimates of young steelhead at USFWS downstream migrant traps.

Eric Gerstung, the CDFG Endangered Salmonids Coordinator, provided adult summer steelhead data used in this report. Data were collected by both CDFG and the USFS and counting methods may have changed over time. While recent counts often cover the entire holding area of a stream, formerly only index reaches were surveyed. A second variable of the counts is different designation for the length of fish considered half-pounders. The half-pounder is a steelhead that has only visited the ocean for less than a year before returning to fresh water. Despite the variability of counting methods, a clear trend emerges when comparing Klamath and Trinity River summer steelhead returns before and after 1989 (Figure 2-11).

Major drops in adult summer steelhead numbers are evident in every Klamath tributary after 1989. In contrast, the North Fork Trinity and New River summer steelhead runs have increased in abundance in the same time period. Several Klamath River tributaries that have collapsing summer steelhead populations , such as Clear Creek and Wooley

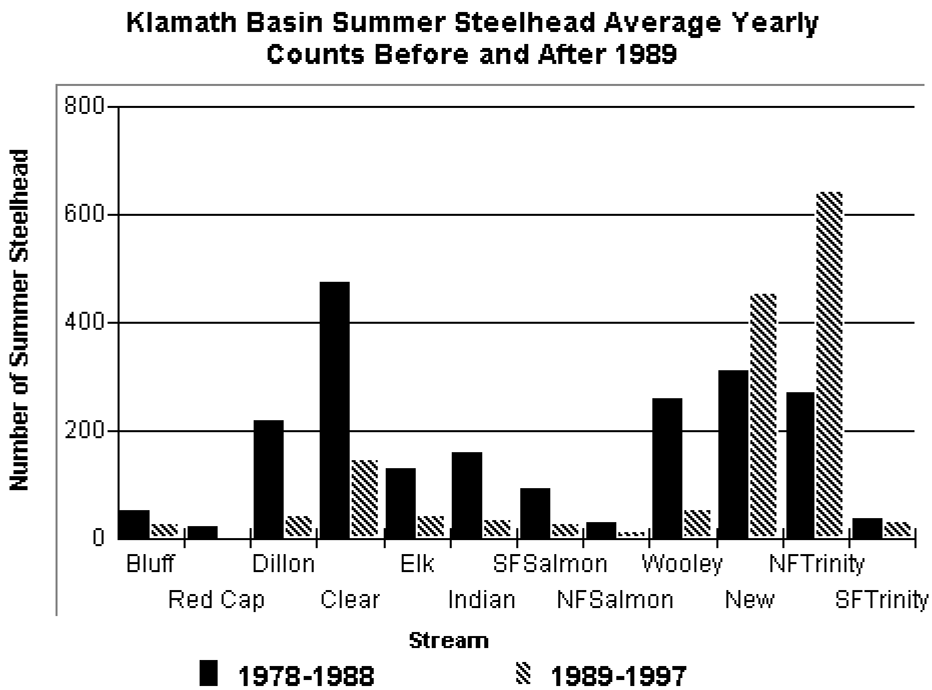

Figure 2-11. Summer steelhead average annual returns to all Klamath and Trinity basins before and after 1989. Data from Eric Gerstung, CDFG Endangered Salmonids Coordinator.

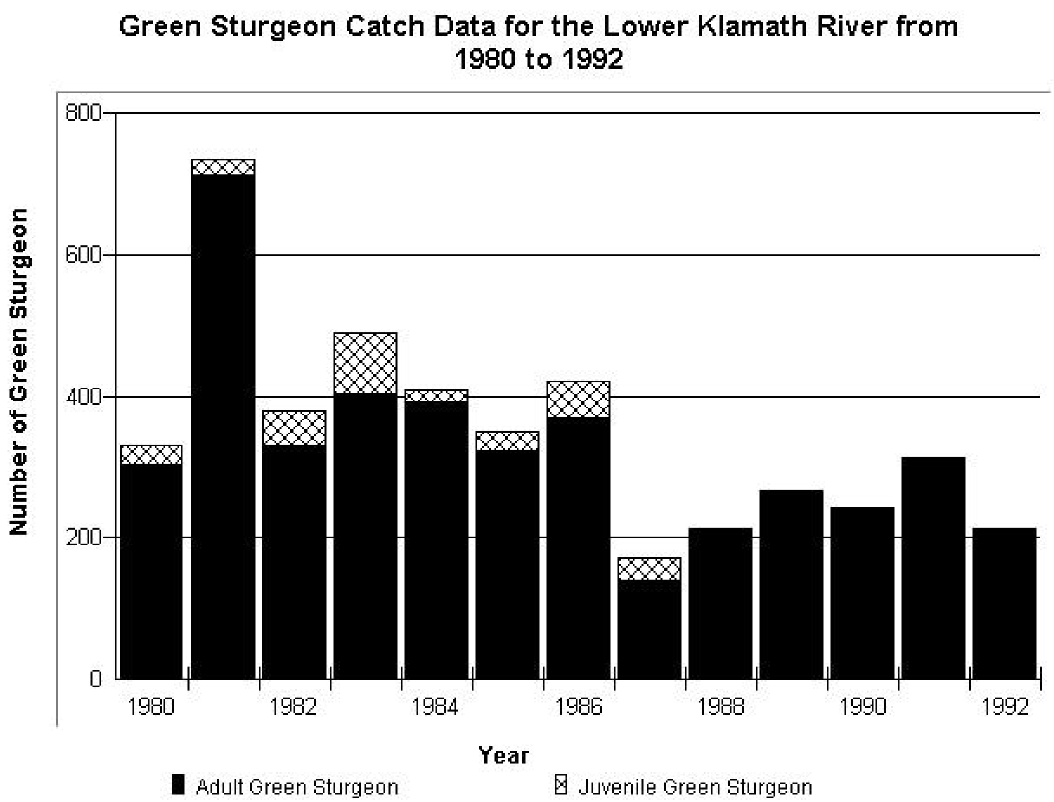

Figure 2-12. Green sturgeon catch trends in Indian net fisheries on the Yurok Reservation from 1980-1992 provided by USFWS, Arcata.

Creek, have not experienced any substantial habitat deterioration. The summer steelhead population in Clear Creek decreased dramatically in the 1990's. Adults numbered fewer than 100 in most recent years whereas surveys prior to 1989 usually found several hundred (average 434) with 1810 counted one year. Summer steelhead returns to the Salmon River basin have declined from an average of 376 annually, before 1989, to an average of 96 adults since 1989 at the same time spring chinook were increasing. It is likely that problems in the mainstem Klamath River are at the root of the decline of summer across the basin.

The half-pounder life history is much more common in Klamath River steelhead than in those that return to the Trinity River (Hopelain, 1998). Half-pounders enter the river in July and August, a time when Klamath temperatures have reached acutely stressful or lethal levels in recent years. Half-pounders are the focus of a catch-and-release fishery that may have some significant un-intended side-effects. The incidental hooking mortality associated with exercising fish in highly stressful water temperatures could be very high. It is also possible that intra-specific competition between summer steelhead juveniles and very large releases of hatchery chinook may also have played a role in the decline of these fish.

Coastal cutthroat trout

Voight and Gale (1998) found that coastal cutthroat trout were widespread in Lower Klamath tributaries but no population estimates were conducted. They advanced the hypothesis that anadromous cutthroat were greatly reduced by habitat loss, citing almost no cutthroat trapped in downstream migrant traps. However, resident cutthroats have increased in relative abundance to other salmonid species in the Lower Klamath because they can express a resident life history. Resident cutthroat typically dominated upper reaches of streams, although densities were sometimes low.

Green sturgeon

Nakamoto and Kisanuki (1995) sectioned pectoral fin rays from green sturgeon caught in Indian net fisheries to determine age and growth of the species in the Klamath River. The samples were collected by USFWS from net harvest specimens and those captured in estuary beach seining. Findings are that Klamath green sturgeon have three life history phases: freshwater juveniles (< 3yrs. old), coastal migrants (3-13 years old for females and 3-9 years for males) and adults.

One interesting and encouraging finding is that there are many different age classes of sturgeon represented in the fishery and some indication that recruitment has continued into recent years. Catches of juvenile sturgeon in downstream migrant traps confirm this assertion. Catch data of green sturgeon from Indian net harvests (Figure 2-12) indicate that at least hundreds of these fish return to the Klamath River annually but no overall population estimate is possible.

Pacific lamprey and eulachon

Larson and Belchik (1998) monitored Indian fisheries and also conducted test fisheries for eulachon. They found that there was no baseline data for either of these species but conducted interviews with Tribal elders regarding past abundance of both species. Eulachon were so abundant that hundreds could be captured in one scoop of the net until the 1960's. Only one specimen has been captured incidentally by a Yurok dip netting for salmon. There is no hypothesis advanced with regard to the near extinction of eulachon, but it is likely that shifting bedload conditions in the lower mainstem Klamath after the 1964 flood caused their demise. Pacific lampreys are still caught by Yurok fishers but catches have declined substantially.

Using downstream migrant trapping data as an index for recruitment

USFWS has operated downstream migrant traps on the mainstem Klamath and Trinity Rivers consistently since 1991. Their most recent report (USFWS, 1998) provides a comparison of juvenile recruitment for chinook salmon, steelhead and coho salmon. Because trap efficiencies have been calibrated, annual estimates of the number of juvenile fish passing the trap can be calculated. Juvenile chinook abundance has varied from 77,230 in 1995 to just under 2,000,000 in 1998 (Figure 2-13), although more than 50% were hatchery fish in the latter year. Juvenile coho salmon estimates are several orders of magnitude lower, ranging from a high of over 6,000 in 1993 to 460 in 1998 (Figure 2-14). Steelhead downstream migrant estimates for the Klamath River range from just a low of 2,188 in 1995 to a high of 64,830 in 1998 (Figure 2-15). While downstream migrant trapping does not allow calculation of a population estimate for any species, it does provide an index for potential recruitment.

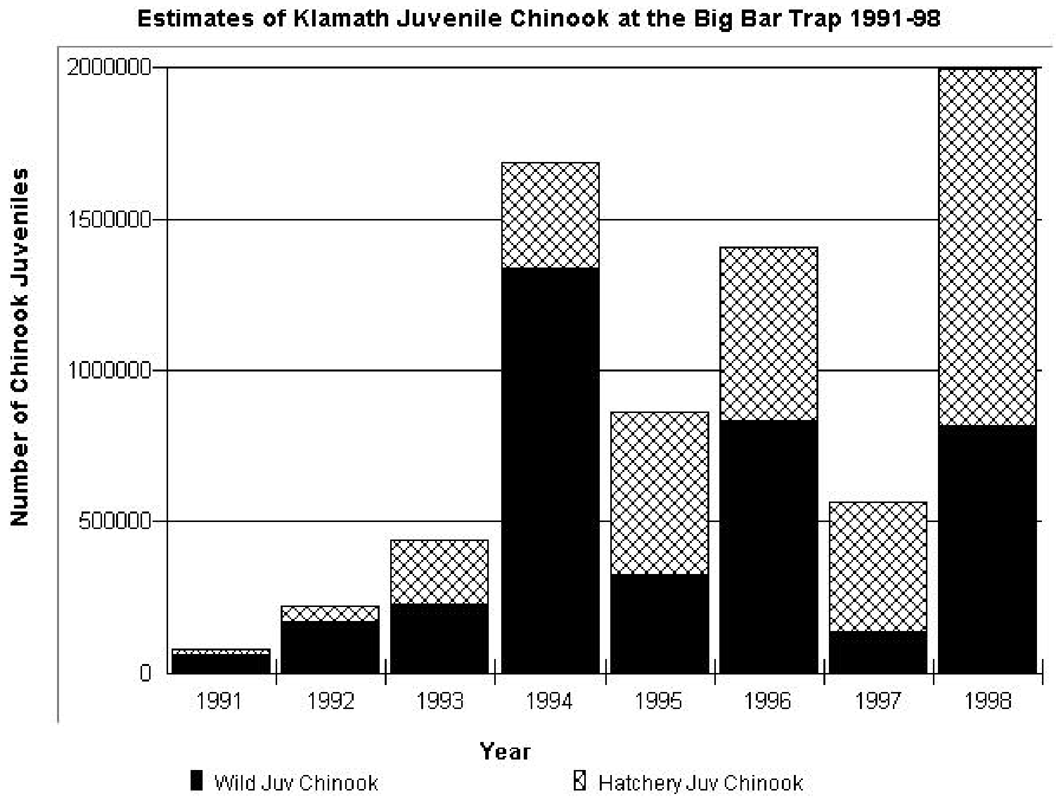

Figure 2-13. Juvenile chinook salmon estimates by USFWS at their Big Bar Downstream Migrant Trap. USFWS 1998.

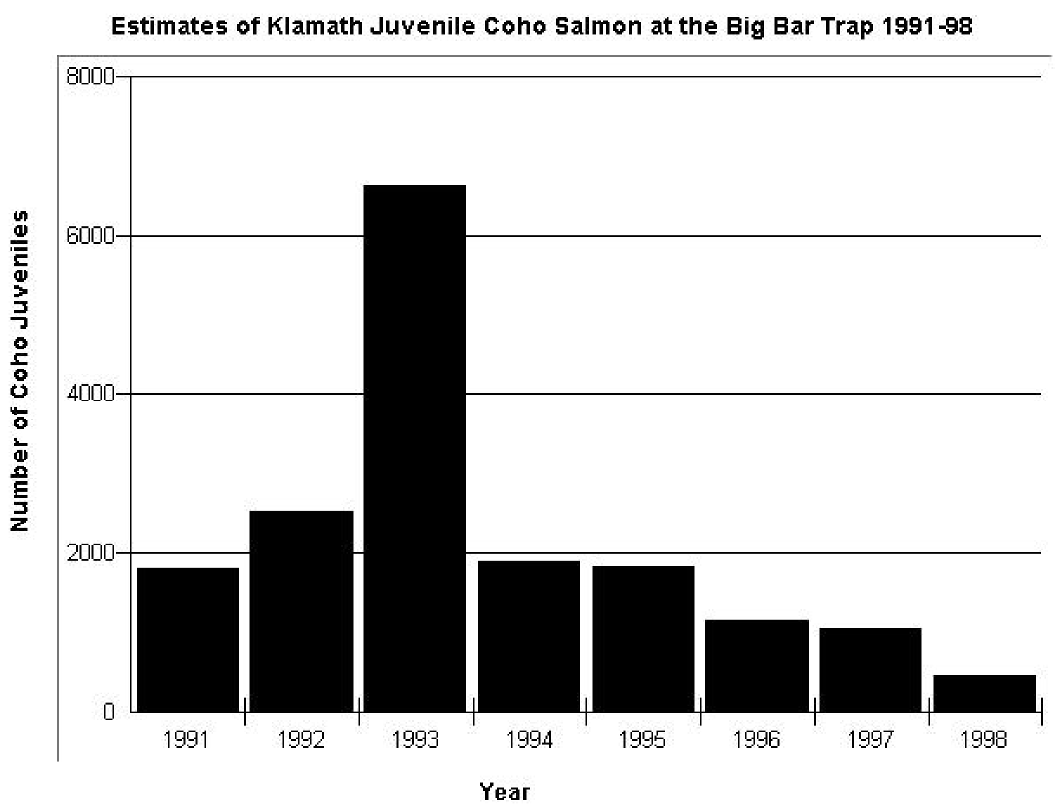

Figure 2-14. Estimate of the juvenile coho salmon passing the Big Bar downstream migrant trap operated by USFWS from 1991 to 1998. Data from USFWS, 1998.

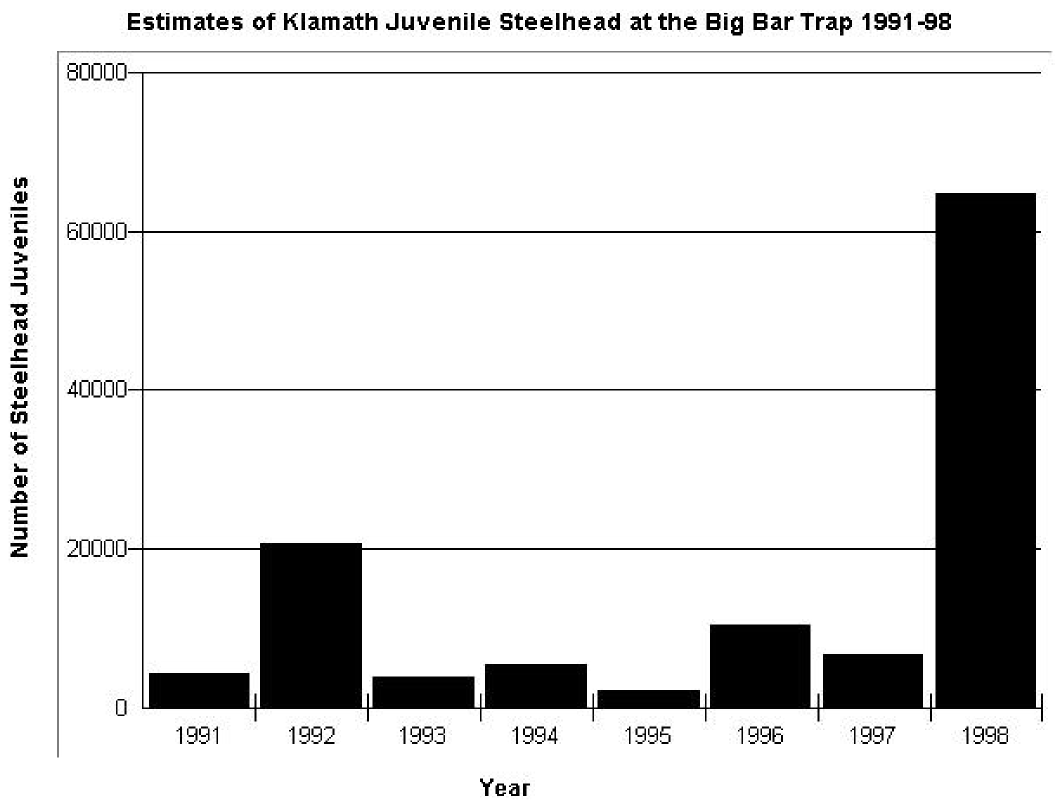

Figure 2-15. Estimate of juvenile steelhead passing the Big Bar trap by year. Data from USFWS, 1998.